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# SCIENCE

FRIDAY, OCTOBER 22, 1909

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## A CAREER IN MEDICINE AND PRESENT-DAY PREPARATION FOR IT<sup>1</sup>

Mr. President, Members of the Governing Boards and of the Faculty of Leland Stanford Junior University, Students in the University and Guests: It is my privilege to come at the invitation of this university to share in the inauguration of a new department in the university. To-day you are commencing a work which means much for the progress of medicine in this fair land of ours, and to be permitted to share in these exercises is a privilege and an honor which I esteem highly.

I come, too, bearing to you the greetings and good wishes of the faculty of medicine of Harvard University, who welcome you into the fellowship of university medical schools. This band of university medical schools is as yet but a small one. However, in the last decade and a half a slowly increasing number of medical schools have developed as integral parts of universities, constituting genuine university medical schools. Unfortunately this number is even smaller than is at first apparent, for in some instances the union between medical department and university is merely nominal. Small, however, as is this group, it has already exerted a powerful influence on medical education and has been one of the forces at work changing medical instruction and medical schools to keep pace with recent wonderful developments in medical science, and it will play a yet larger part in the medical uplift of the future. To strengthen this group with a

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

<sup>1</sup> Address at the dedication of the department of medicine in Leland Stanford Junior University, September 8, 1909.

medical school supported by the great resources of this university means much, therefore, as I have already stated, for the progress of medicine in this country, and the medical profession is to be congratulated on your determination to begin a medical department.

It may not be inappropriate at this time, before an academic audience, to discuss the possibilities of a career in medicine and present-day preparation for it, incidentally considering some of the many problems of medical education and indicating the magnitude of the task that lies before this institution in developing a medical department that shall be a credit to the foundation so bountifully provided by Leland Stanford for a great university in this glorious state of the Pacific slope.

If I may be permitted to subdivide this audience, I will address myself especially now to the students present and indicate, as best I can, what a career in medicine has to offer those who undertake the study of medicine. I would have you consider medicine broadly as one of the biologic sciences to be entered into after a collegiate training with some knowledge of others of the group of scientific studies, more especially of chemistry, physics and zoology. After the preliminary training the prospective medical student must devote four years to medical studies, and at the end of these years he should enter a hospital for one or two years of practical work; in all, six years of medical training. At the expiration of these years he may do one of several things: he may begin the practise of medicine; he may become a surgeon, a medical consultant or a specialist; he may choose teaching and investigation, or he may devote his energies to public health work. Here is a wide variety of possibilities for his selection. Which is he to take? Personal desire and adaptability are important factors in the choice. Each offers its own

attractions and rewards, measured often by different standards.

To the many in our medical schools the practise of medicine will open its doors and to most of you this work—that of the family physician—is best known. He who enters into the practise of medicine may look forward to a moderate income measured by the standards of modern business and a life that will bring him into a peculiarly intimate, serviceable relation with his fellow men. Probably in no other calling is there such an intermingling of work for wage and work that brings its blessings to others, and in this lies the peculiar charm of the practise of medicine. The physician's advice not only is sought in matters of health and disease, but gradually he grows to be family councillor too, the recipient of family secrets and a sharer in family joys. In many communities the physician is an important figure in all that pertains to the activities of the place, often filling positions of responsibility, a man honored, loved and respected by his fellows. Freely he gives of his time, his mind and his love; but equally great is the reward which he reaps in the gratitude of his patients and in the satisfaction of knowing that within his limitations he has richly given of the talents vouchsafed him. Many are his opportunities for doing good to his fellow men, nobly does he respond to these calls. The charity of the rank and file of the medical profession throughout this broad land of ours is one of the glories of medicine. So to engage in the practise of medicine offers you many opportunities to do good and at the same time this work will furnish you a living income, gained soonest in the smaller places, while in the large cities there are opportunities for obtaining incomes of even large size, but it must be realized that in the large city, though there are great prizes to be won by a few, there are many who will fail in the

competition for them, and the smaller place offers a more certain reward to the medical man of good training, good habits, good health and perseverance.

A smaller percentage of medical graduates may continue their preparation beyond that of the practitioner, with the intention of becoming surgeons, medical consultants or specialists. More and more at the present time is surgical work done by men specially trained and who confine their work to surgery as opposed to the older plan, very generally followed, of each physician doing some operative work. Even with a very great increase in the number of diseased conditions amenable to surgical treatment, one skilled surgeon can do all of the work needed by a population of considerable size and not a very great number of surgeons are needed in a community. Consequently only a comparatively few are likely to attain to success in this branch. For the few who do, the reward is great and the successful surgeon obtains an income large even when compared with the incomes of present-day industrial life, but this success comes only after a period which has involved a number of years' preparation beyond that received by him who enters general practise. A considerable special knowledge of anatomy and pathology is needed by the surgeon and this entails many hours of painstaking work. Then comes the period of assisting some trained surgeon, gradually attaining the manual dexterity and the knowledge that are required for the surgeon. The surgeon's apprenticeship should last six to eight years, years in which his earning capacity has been relatively small and his labors arduous. Remembering this, the surgeon surely deserves a good income when his period of matured activity comes and a small group of men can anticipate this success in surgery.

For the medical consultant a very sim-

ilar period of preparation is required. This possibility to the young graduate is essentially a recent development in medicine in this country. In the past, the medical consultant has been almost invariably a man of mature years, trained by an extensive general practise from which he has gradually withdrawn as his consultation work has grown. Now there is a field for a differently trained consultant, though there is undoubtedly still a place in consultation for the matured judgment of the general practitioner, where his practical experience is of extreme value. Still the young graduate to-day can deliberately train himself for consultation work. A few years should be spent by him in the laboratory gaining first-hand knowledge of some one of the fundamental sciences of medicine, anatomy, physiology, pathology, bacteriology, chemistry or pharmacology. Then a large part of his time should be devoted to work in the hospital, where he may combine observation of many patients with laboratory investigation, supplementing all, of course, with study of medical literature. Five or six years of such work will give him a deeper knowledge of the facts and methods of medicine than many more years spent in general practise, and this knowledge should be useful to the general practitioner, too busily engaged with routine for maintained study of a subject which like medicine is constantly progressing and developing. Gradually there has come a call for the consultant so trained and I believe in the future an increasing number of consultants will be thus trained and this field of work will be offered as a possible career for the graduate in medicine, yielding him a better income than general practise, though rarely as great as that gained by the successful surgeon.

There are various fields of special medical work open to graduates, such as diseases of the eye, the ear, the nose, etc. In

all of these in the larger places there are men who limit their work to some one of these special branches and for which work they have prepared themselves by several years of special study. In almost all of these special branches of medicine, practise differs from the other fields of medical work already described in that a very large per cent. of the patients come to the office of the doctor and practically all of the work can be done within certain fixed hours, leaving greater freedom to the physician, and this, to many, forms an attraction in these specialties beyond the considerable income that may be derived from their practise.

To the graduate in medicine to whom active practise does not make an appeal, the quiet life of the laboratory and the lecture room is open. Teaching and investigation in medicine, as in other branches of university work, demand a certain number of men. In recent years the demand in this field has been rather in excess of the supply and for a few years this demand is likely to increase gradually, for more and more medical schools are placing the instruction—at least the instruction of the first half of the medical curriculum—in the hands of men who give all of their time to instruction. In addition, various institutions of medical research, independent of medical instruction, have been founded and these require men of medical training to conduct their investigations. Hospitals now employ various laboratory-trained men and furnish occupation for many of this class. So far the demand from hospitals has been largely for men of pathological training, but now the chemist and the physiologist begin to be sought. Clinical teaching and investigation as a career is just beginning to develop in this country, but surely in the near future there will be a considerable demand for men adequately trained for this work. Medical

investigation offers a fertile field for the properly qualified man and in it honor and fame will be won in the future as in the past. Teaching in medicine has a certain advantage over academic teaching as a career in that often with the teaching there is combined the opportunity for some remunerative use of the same training as renders the individual successful as a teacher; I refer to demands for his aid in various diagnoses, or the possibility of combining teaching with some salaried position in a hospital or mingling with the teaching a certain varying amount of special practise. In these ways the teacher in medicine is not as absolutely dependent on his salary as a teacher of most other subjects, and in case a teaching berth grows unacceptable, he may fall back on the practise of medicine for a livelihood.

I have not particularly enlarged upon medical investigation as a career, since it is included now so generally in the career of teaching and because pure investigation is not so much planned as a career as the true investigators—very few in number—are spontaneously drawn into it.

Public health work is almost in the beginning of its development in this country, but in a few years it is to be anticipated that there will be a very considerable demand for men trained in hygiene and preventive medicine to serve as health officers and sanitary advisers at good salaries. This is a demand for which our medical schools are just beginning to provide by the establishment of departments, but the next few years will show great advances along these lines and many men will be attracted by this field of work.

I have attempted to point out to you that the prospective medical student is not entering on a career of very limited possibilities, but that after graduation he has considerable choice as to his future work and may choose among several forms of

medical activity that for which he is best adapted.

To the members of the faculty it is evident that to equip students for these various phases of the medical career, a medical school must possess extensive equipment and large resources to which it receives students with adequate preparation to profit by the instruction offered. During the past five years much progress has been made in elevating the standard of medical education by increasing the entrance requirements to our medical schools. There has been much discussion as to the best preparation for the study of medicine. Training in chemistry, physics and zoology with a reading knowledge of French or German are very generally deemed the essentials of a satisfactory preliminary preparation for medicine, because medicine itself is very largely a biologic science, using the methods of these other sciences, and because in the study of anatomy, physiology and medical chemistry much time is otherwise consumed in teaching what the student might readily have learned in college, while the modern languages are needed that the student may utilize more extensively the literature of medicine. Just how much general college training beyond these subjects should be required has been largely debated. No one would deny that the better education the student has before he begins medicine, the more he is apt to profit by his medical studies, yet this may be readily carried to an absurd point since preliminary work consumes time and too much of it would make the period of medical study come too late in life. A college course of three, at most, four years, including work in physics, chemistry, zoology and modern languages and leading to a degree of A.B. or B.S., is at present regarded widely as an ideal preparation for the study of medicine, but this is open to the criticism that it gives us in the medical

schools students of too old an average age. Assuming that such a college A.B. or B.S. course is an ideal preparation for medicine, it has already been adopted in several medical schools making the period between entrance to college and the commencement of the practise of medicine a period of from eight to ten years, divided as follows: college three to four years, medical school four years, hospital one to two years.

At present, after such preparation, most men begin medical practise too late in life. To start them earlier in their life work is one of the great problems before us. This can be done best, I believe, by, in some way, lowering the age of entrance to college—perhaps by changing instruction in the preparatory schools. Another method of lowering this age has been sought in the so-called combined course by which the A.B. degree is awarded at the expiration of four years' work, two years' college work, including physics, chemistry and zoology, and two years' medical work and the M.D. degree at the expiration of two more years, a total of six years instead of seven or eight years for the two degrees. But do not let ourselves be deceived by this. Reduced to plain facts this means two years of college work, including physics, chemistry and zoology, as an entrance requirement to the medical school, and such institutions as have the combined course are to be classified in the group of medical schools requiring only two years of college work for entrance unless we attribute some intrinsic educational value to the right acquired by the students of adding A.B. after their names—a thing which I take it no one would claim. Rather does it seem to me that these schools have succeeded in rendering the A.B. degree of less value and significance than formerly and have sacrificed one or two years of college work while seeking to conceal this fact by the award of the two degrees, A.B. and M.D. In the

combined course two years of work are counted for two degrees, another fact which has brought criticism on the plan.

It must be remembered, in discussing entrance requirements, that it is not yet proved whether one or two years of college work beyond the two years demanded by many medical schools as an entrance requirement is of more advantage than a one or two years' earlier start in medical work. It is very generally conceded that a knowledge of physics, chemistry and zoology and the ability to read French and German medical literature, are very helpful to the medical student of to-day who pursues a quite definite curriculum of study, and this knowledge can scarcely be obtained in less than two years of college work. Beyond this we are still experimenting, and gradually by comparing graduates under varying entrance requirements we may satisfactorily solve the problem. It is very important that this be done, and for this reason I have discussed the combined course and pointed out that it should be classified where it belongs,—*i. e.*, as two years of college work for entrance to the medical school.

The problem is further rendered complex by students transferring from one school to another. A university, in fact, may discriminate against its own students if it requires a degree for entrance, does not give a combined course and accepts students with credit for advanced standing who have had part of a combined course. Under these circumstances a graduate of its own collegiate department must spend at least one, possibly two, more years between college entrance and graduation in medicine than the student transferred from the institution giving a combined course. This actually happens in certain institutions. So in the solution of our problem students transferred from one school to another must be carefully classified to

prevent incorrect deductions from our statistics.

Making these allowances, we have now very fair conditions for comparing students with various preparations, since schools with good medical equipment are making these different requirements for entrance. The evident advantages so far gained by demanding for entrance to the medical school, a college degree with certain specified studies are: a more mature, uniformly trained student easier to teach; a decreased number of students receiving more personal attention, and an increased number of hours available for medical studies gained by the relegation to college of preliminary courses in physics, chemistry, zoology and botany, formerly included in some form in the medical curriculum. Opposed to these are certain disadvantages: the relatively old age at which the medical man actually begins his life work; the barring of medicine to men unable to secure the preliminary education among whom will undoubtedly be men of great potential ability; the possible lowering of the standard of country practitioners, as the college-bred man tends to have an aversion to country life and will leave country practise to graduates of the poorer medical schools which usually keep behind the latter in their demands for preliminary education. To-day the advantages appear to outweigh the disadvantages, though it does not seem advisable were it possible to increase at once entrance requirements in all schools to a college degree. To have done so in certain schools has greatly benefited medical education, but the future may show that the pendulum has swung too far or that it has not swung far enough. We must regard the matter as still in the experimental stage and every institution must seek to contribute towards its solution.

Having determined on a standard for

admission to the medical department here at Stanford, what preparation should the faculty seek to give its students for a career in medicine? It is evident that if, as I have pointed out, the career of medicine offers several possibilities for life-work, the medical school must furnish a certain elasticity of preparation. However, you must recognize first of all that by far the larger number of your students will become general practitioners and the world at large will judge the success of your medical school by the type of general practitioner you send out. To the casual observer a medical school is merely a place for training men for the practise of medicine—it is to them a technical school, not a university department. So you must seek to train your men for this part of the career of medicine as well as it is possible. On them will rest a great responsibility—the responsibility of giving to their fellows the best that modern medicine has to offer in preventing disease, in mitigating its pains and in curing its attacks. With a broad knowledge of medicine as a biologic science, with an intimate knowledge of the normal and abnormal mechanism of mind and body, with a rational grasp of all forms of therapeutics and a thorough training in the diagnostic methods of medicine, you must prepare your students for this responsibility. There will, of course, be laboratories and clinics with adequate equipment, representing an investment of many thousands of dollars. Men to man these you will secure, choosing the best in the land, for after all, men more than buildings are the particular pride of universities.

The organization of the departments giving instruction in the first two years of the medical curriculum is easier to-day than of those dealing with the later years, the clinical instruction. In our medical schools there is more uniformity of instruction in anatomy, physiology, chemistry,

pathology and bacteriology than in the other branches of the medical course, and I believe good instruction is more generally given in these. One reason for this is that the necessary money is the only limitation to the possession of satisfactory laboratories and to obtaining competent men for these subjects. Sufficient material for instruction is usually quite easily obtained. On the other hand, to the satisfactory development of clinical instruction conditions in American medicine have furnished many obstacles—obstacles which I trust this university is to take an active part in removing. For satisfactory efficient clinical teaching hospitals are absolutely essential with many patients with which students can come into close contact. The separate development in America of hospitals and medical schools has retarded clinical teaching. In this country hospitals are usually municipal or privately-endowed institutions under their own governing boards. With rare exceptions do medical schools exercise any influence in determining staff appointments in these hospitals. In them seniority promotion is often the rule and this in itself withdraws a very strong stimulus for the best work and acts to retard the development of members of the hospital staff. Under these conditions the medical school has but little choice in its selection of professors and instructors in clinical subjects. The man controls the clinical material which the medical school must have and so he becomes professor whatever may be his qualifications for teaching. Very generally in our hospitals members of the staff are on duty but three or four months of the year. This necessitates multiplicity of teachers and prevents continuity of instruction and investigation. These are factors on the side of American hospital organization which have acted to retard clinical teaching and clinical investigation and which should be changed in



the future. A medical school must control appointments in the hospitals where its clinical teaching is done and the terms of service must be continuous throughout the year if the highest development is to be attained. Clinical professors, like other university professors, must be chosen because they are the best teachers and investigators available and this can never be the case so long as only local men are possible of selection.

Medical schools themselves have been responsible in part for the present state of clinical teaching on account of the very meager salaries, or worse still, no salaries, paid its clinical teachers. This has resulted frequently in teaching receiving just as much attention as under these conditions it deserved, *i. e.*, secondary consideration. Medical schools have expected the clinical teacher to be remunerated by the advertising the position gave him and when the advertising was profitable they have complained because private practise has interfered with school work. What else, pray, could be expected? Let us suppose that a university had attempted to develop its chemical department, for example, by limiting its choice of instructors to its locality, paid them slight or no salaries, asked them to make a livelihood doing private chemical work, such as assays, etc., and had them work in buildings and with apparatus owned and controlled by another corporation. How absurd the proposition! How could a university chemical department develop under these conditions? Yet these are conditions not essentially different from those under which many, many medical schools have attempted to develop clinical departments.

I would impress on the governing boards that a medical department is very expensive. Numerous laboratories are needed, and much apparatus. Professors and instructors in the laboratories must be paid

university salaries and often the maximal salaries, since there is a growing demand for the better instructors, and an institution can not afford to lose too many of its trained men. Clinical professors must be paid salaries, too, in proportion to the time they give to teaching work. Of clinical teachers there should be two classes, those who devote a large part of their time to medical school work and those who devote a small part. In the first group should come at least the heads of the more important departments, such as medicine and surgery. Some advocate having professors of medicine and surgery who engage in no private practise but confine their work to the medical school and the hospital. It is an advantage, however, to my mind, for them to do a limited amount of private work because much of the best material for study comes through these channels and, on the other hand, the public has a right to some of the services of these more highly trained men. These men will probably have to be paid more than university salaries for both hospital and medical school work, since they would be men who in private work would earn far larger incomes. In addition to these men devoting the major part of their time to academic work, the services of the men in private practise are needed. They are in a position to teach to students particularly well the art of medicine, if I may use the word without being misunderstood. From their particular experience they have something of value to impart to students and they should be made use of and paid in ratio to the time devoted to teaching. Then the medical school of to-day requires a very large teaching force, since so much of the teaching can be done satisfactorily only in small groups of students. This again increases the cost of medical instruction.

In medical schools the older fixed curriculum is giving place to a modified elect-

ive system in order that medical instruction may have that elasticity demanded by the different possible lines of work to be followed by the graduate. Election within the medical curriculum is at present somewhat limited by the requirements of the state licensing boards and as almost all graduates will practise medicine in some form, each medical school must offer a curriculum meeting the requirements of these boards. However, such can be met and still the student be allowed considerable freedom of election. At Harvard there is now complete freedom of election in one year of the four years of medical study and this has proved a satisfactory arrangement. This question of freedom of election in medical studies must be carefully considered in the future. It must be recognized that our present more fixed curriculum has been somewhat more an accidental development than a studied, planned growth. New subjects of a developing medical science have in the past been crowded into the curriculum. Now that is full and new subjects can be added only as the result of readjustment of the curriculum or be left to an elective period. This fact will necessitate in the future change in our medical instruction and will be a probable cause of extension of election in medical studies. If a very free elective system develops, entrance requirements again will need readjustment and these are problems for much thought by medical pedagogians. The proper position of the so-called specialties in the medical curriculum will be another problem for future consideration. A glance at the course of study in different medical schools will show much variation in the number of hours required in this or that specialty, indicating the action of local influences more than thought as to the real needs of the students. An elective system may aid in adjusting the specialties but still a necessary minimal

must be determined for the student destined for general practise. Up to the present time the gradual growth and development of special fields of medical work has exerted a disintegrative influence on medical instruction resulting in a higher development of the resulting parts, but now there is need for integration and balanced adjustment of the parts to form a more perfected whole.

In a medical school equipped for proper training of practitioners there will, of course, be laboratories and men capable of conducting advanced work in various branches of medicine, to prepare students as surgeons, consultants, specialists, teachers, etc. This part of the medical work constitutes university work in the usually accepted idea in contradistinction to college and technical-school work. Advanced students and instructors will conduct investigations and publish, for the use of the world, their results. Without this no medical school can be regarded as a university medical school. What attitude should the university at large assume toward university medical work? There has been a marked tendency on the part of academic circles to disparage the work of medical departments and a lack of disposition on the part of university professors to accept work in medical subjects as university work. Happily this attitude is disappearing, though in rare instances is the medical work accorded its true place in the university organization. There is no essential difference between the methods followed by the pathologist in his investigations and those followed by the zoologist in certain of his fields of work; the medical chemist uses the technical procedures of the organic chemist; the bacteriologist is an investigator in a special field of botany. That, in the medical departments, man and his diseases is the ultimate subject of study is no reason for regarding these studies as less

cultural than other university subjects. Is there any real reason why an advanced student in zoology should be awarded a higher degree, such as that of doctor of philosophy, for special sustained work in that subject, while this degree is withheld from the advanced student in pathology or anatomy or any other medical subject? You all know the opposition offered by the departments of literature, language, philosophy, etc., in the past to the recognition of the sciences as university subjects and parts of the curricula of candidates for the bachelor of arts degree. Gradually, however, this opposition gave way and the sciences were received by the academic councils on the same footing as the older humanities. Some such process is now going on in medical subjects. I believe the day will soon come when higher degrees will be awarded for medical studies, just as for other university subjects. Perhaps some of the faculty present may resist this move. I trust not, but if they do, I feel sure that eventually they will be on the losing side. Harvard, I am glad to say, has already recognized this claim of medicine and there is, in the organization of the faculty of arts and sciences of Harvard University, a division of medical sciences similar in organization to the division of ancient languages, or other divisions of that faculty, granting higher degrees—master of arts, master of science, doctor of science and doctor of philosophy—as in other divisions of the university faculty of arts and sciences. This division of medical sciences is composed at present of members of the departments of chemistry, physics and zoology, of the faculty of arts and sciences and of members of the departments of anatomy, comparative anatomy, physiology, comparative physiology, pathology, comparative pathology, bacteriology and biological chemistry, of the faculty of medicine and there are candidates for higher

degrees working in several departments of the Harvard Medical School.

The next logical development in medicine as a university subject will be the acceptance of some of the clinical branches as proper training for higher degrees. I realize that this idea will be repugnant to many in academic circles who regard medicine and surgery as purely technical professions. A comparatively few years back and such was the case. Examination of a modern department of medicine as an example, however, serves to show that there have been great changes in the past twenty years and that now there is much similarity in the methods and ideals of a department of medicine to the methods and ideals of the various university departments. The department of medicine of a present-day university medical school has a laboratory equipped with apparatus for chemical, pathological and physiological investigation and men capable of utilizing this equipment in investigation. By the experimental method diseases are produced and abnormal functions studied. The hospital, with its patients, is another great laboratory into which natural disease comes for investigation and the attitude of the department of medicine toward the hospital is not essentially different from that toward the laboratory. The student and investigator in both seek to add to the knowledge of disease facts that may eventually be applied to the alleviation and prevention of the sufferings of humanity. In the hospital are individuals seeking cure from disease and the physician brings to their aid all that medical science can offer. In the diagnosis of their disease the methods and resources of the laboratory are utilized. The treatment applied often has been evolved as the result of animal experimentation. The result of the treatment on the particular individual is part of a great experiment built up of innu-

merable observations of just such individual cases. To each individual the physician applies the method which, based on previous experience, would seem to offer him the greatest aid. In receiving the best that medicine has to offer, the patient is contributing a part to further advancement of medical science. It is universally conceded that a university hospital with such a relation to laboratory and medical instruction affords its patients the most accurate diagnosis and the best treatment possible.

Now, if in such a department of medicine investigations are conducted by the methods of the biologic sciences with the view of adding something to the sum total of human knowledge, is there any essential difference between its methods and ideals and those of any university department?

Many studies of the heart beat in animals have been awarded a Ph.D. degree in university departments of physiology. If in a department of medicine the heart beat of man is studied, should less credit be given for equally good work? Surely, the turtle's heart beat is of no greater import than that of man. But you say that in the turtle you can control the conditions of the experiment—not in man. True, but in man, natural disease often performs the experiment for you. Take the condition of heart-block in which disease has severed the continuity of conduction impulses between the auricles and ventricles of the human heart, and produced disturbances in the cardiac system which may be investigated during life by methods of the physiological laboratory applied to man. Investigations of these conditions controlled by animal experiments in the laboratory have already thrown much light on the physiology of the heart and seem adequate for higher degrees, if higher degrees are already awarded for quite similar studies in university departments. This is

merely an example of many others that might be cited. Thought on these will, I am sure, convince you that to accept certain forms of work in modern clinical departments for higher degrees is not irrational. Work of this type should afford the best preparatory training for teachers in clinical subjects, as is universally acknowledged to be the case for other university teachers. A medical school thus organized as part of a university will form both the best type of professional technical school and a real university medical school. Nor will the advantage of such an organization be solely on the side of the medical school. The separation, in this country, of the medical school and the university has taken from the university the activities of men who, in other countries have added much to the glory of the universities. The medical school will find inspiration in the ideals and spirit of university work, and the essential unity of medical science and other sciences will be realized in this country when universities and medical schools are closely united.

The development in the west of great universities has brought to the east the stimulation of competition and has resulted in increased development of the eastern universities. The development of western medical schools will, in the same way, stimulate progress in eastern medical schools. We, of the east, have welcomed the organization here in the west of university medical schools, realizing that you will take students that otherwise we might get, but knowing that, from your work, we shall learn, that as you grow we shall grow and that American medicine in this way will attain to that development which the resources of this country amply justify. So we all wish you God-speed in the undertaking which you are inaugurating to-day and gladly welcome you into the brotherhood of medical schools. We shall watch

your development with the greatest interest, expecting to learn much from the way you meet the educational problems of a developing medical science.

To the authorities of Stanford University I can only say, cherish well this new offspring of your university, nourish it carefully, expend on it richly of your resources, that an institution may grow here, a pride to the university, to the state and to the country. In its proper development you will richly reap from your investment, even though the investment be very great. May the medical department of Leland Stanford Junior University have a long and useful career, may its faculty and students contribute richly to the widening of the horizon of medicine, and may its future graduates carry comfort and healing to thousands of suffering humanity.

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#### SUGGESTIONS FOR THE CONSTRUCTION OF CHEMICAL LABORATORIES<sup>1</sup>

*General Construction.*—For a chemical laboratory there is probably nothing better than the so-called slow burning or mill construction. While lath and plaster may be more handsome from an artistic point of view, yet it suffers from the serious disadvantage that the ceiling becomes disintegrated from the acid fumes, with the inevitable result that it drops into the quantitative determinations, to their ruin, or hangs in festoons or fragments that are anything but artistic.

*Walls.*—The walls should, if possible, be faced with white glazed brick; if this be prohibitive on account of cost, at least where they are exposed to view. In place of this, possibly pressed yellow brick, white "silica" brick, or ordinary red brick

painted white may be employed. The paint employed should contain no "white lead," but may be sublimed lead ( $\text{PbSO}_4$ ), barytes or zinc white, or preferably a mixture of these in about equal proportions or lithopone. Some of the so-called cold water paints have been used with fairly good success. They may turn black in damp weather, but usually return to their white color when dry.

*Floors.*—If care be taken to keep the joints tight between the walls and floors there is probably nothing better for a laboratory floor than asphalt. The writer knows of some laid twenty-five years ago that have required no outlay for repairs and are apparently good for another quarter century. Laboratory desks and heavy apparatus should be supported on a broad framework to prevent them from sinking too deeply into it. The asphalt, as wood floors, should be laid upon a heavy grooved and tongued wooden floor with paper between. These floors can be supported upon double wooden beams or upon iron beams kept well painted with a metal varnish coating. Rift hard pine, birch or maple, when carefully selected and laid, makes a good floor, particularly if kept well oiled. This has the disadvantage of making it slippery. It is of course not as tight as an asphalt floor.

*Ceilings.*—Too much attention can not be paid to their construction, as the writer knows of three large new laboratory buildings in which a more or less constant precipitation of sawdust, paint and plaster is taking place upon the floor below, because of an oversight in this particular. This, in one case, is due to the application of a cold-water paint, which is scaling off from the ceiling when the floor above is walked upon. In the other two cases sufficient care was not taken to sweep clean the first layer of floor boards before laying the second. All

<sup>1</sup> This paper was practically in its present form in November, 1907; nearly a year before the articles lately published in SCIENCE.